

Amendments to the Claims

1. **(Currently Amended)** A diffraction element comprising:

a light-transmittable member; and

a diffraction grating which is formed on at least one face of the light-transmittable member;

wherein when a first laser beam having a first wavelength λ_1 and a second laser beam having a second wavelength λ_2 are transmitted through the diffraction element, the diffraction element turns the first and second laser beams ~~are turned~~ into first and second diffracted beams having first and second diffraction efficiencies, respectively;

wherein the diffraction element functions to equalize the first and second diffraction efficiencies ~~to each other~~ by only the one face of the diffraction element; and

wherein the diffraction grating has a first phase modulation amount ϕ_1 for the first laser beam and a second phase modulation amount ϕ_2 for the second laser beam and the first and second phase modulation amounts ϕ_1 and ϕ_2 are, respectively, approximately expressed by the following equations (1) and (2):

$$\phi_1 = 2\pi N_1 \pm \Delta\phi \text{ ---(1)}$$

$$\phi_2 = 2\pi N_2 \pm \Delta\phi \text{ ---(2)}$$

in which "N1" and "N2" are natural numbers and " $\Delta\phi$ " is a phase variation amount.

2. **(Currently Amended)** The diffraction element as claimed in Claim 1, wherein the diffraction grating has a plurality of land portions each having a width W_a and a plurality of groove portions each having a width W_b ~~are alternately arranged in the diffraction grating therein~~ and has a duty ratio ~~is defined as $\{W_a/(W_a+W_b)\}$~~ so as to assume a value other than 0.5.

3. **(Original)** The diffraction element as claimed in Claim 1, wherein the first laser beam is a blue laser beam having a wavelength of 380 to 420 nm as the first wavelength λ_1 and the second laser beam is a red laser beam having a wavelength of 630 to 680 nm as the second wavelength λ_2 .

4. **(Currently Amended)** The diffraction element as claimed in Claim 1, wherein the diffraction grating has a depth h of the diffraction grating is approximately expressed by the following equation (3):

$$h=[N\lambda_1\lambda_2/\{\lambda_1(n_2-1)+\lambda_2(n_1-1)\}] \text{ ---(3)}$$

in which "N" is a natural number, "n1" is a refractive index of the diffraction element for the first laser beam and "n2" is a refractive index of the diffraction element for the second laser beam; and

wherein a zero-order diffraction efficiency of the first laser beam and ~~that a zero-order diffraction efficiency~~ of the second laser beam are ~~approximate~~ approximately equal to each other and a first-order diffraction efficiency of the first laser beam and ~~that a first-order diffraction efficiency~~ of the second laser beam are ~~approximate~~ approximately equal to each other.

5. **(Currently Amended)** The diffraction element as claimed in Claim 4, wherein the diffraction grating has a depth h1 of the diffraction grating is expressed by the following equation (4):

$$h1=[\lambda_1\lambda_2/\{\lambda_1(n_2-1)+\lambda_2(n_1-1)\}] \text{ ---(4)}$$

in which the natural number N is set to 1 in the equation (3).

6. **(Currently Amended)** The diffraction element as claimed in Claim 5, wherein the diffraction grating has a plurality of land portions each having a width Wa and a plurality of groove portions each having a width Wb are alternately arranged in the diffraction grating therein and has a duty ratio is defined as $\{Wa/(Wa+Wb)\}$; and

wherein when the duty ratio is 0.135, a ratio of the zero-order diffraction efficiency to the first-order diffraction efficiency is approximate to (10/1).

7. **(Currently Amended)** The diffraction element as claimed in Claim 4, wherein the diffraction grating has a depth h2 of the diffraction grating is expressed by the following equation (5):

$$h2=[2\lambda_1\lambda_2/\{\lambda_1(n_2-1)+\lambda_2(n_1-1)\}] \text{ ---(5)}$$

in which the natural number N is set to 2 in the equation (3).

8. **(Currently Amended)** The diffraction element as claimed in Claim 7, wherein the diffraction grating has a plurality of land portions each having a width W_a and a plurality of groove portions each having a width W_b ~~are alternately arranged in the diffraction grating therein~~ and has a duty ratio is defined as $\{W_a/(W_a+W_b)\}$; and

wherein when the duty ratio is 0.2, a ratio of the zero-order diffraction efficiency to the first-order diffraction efficiency is approximate to (10/1).

9. **(Currently Amended)** The diffraction element as claimed in Claim 4, wherein the diffraction grating has a depth h_3 ~~of the diffraction grating~~ is expressed by the following equation (6):

$$h_3 = [3\lambda_1\lambda_2 / \{\lambda_1(n_2-1) + \lambda_2(n_1-1)\}] \text{ ---(6)}$$

in which the natural number N is set to 3 in the equation (3).

10. **(Currently Amended)** The diffraction element as claimed in Claim 9, wherein the diffraction grating has a plurality of land portions each having a width W_a and a plurality of groove portions each having a width W_b ~~are alternately arranged in the diffraction grating therein~~ and has a duty ratio is defined as $\{W_a/(W_a+W_b)\}$; and

wherein when the duty ratio is 0.5, a ratio of the zero-order diffraction efficiency to the first-order diffraction efficiency is approximate to (10/1).

11. **(Original)** The diffraction element as claimed in Claim 1, wherein the diffraction grating is formed by material having polarization anisotropy.

12. **(Original)** The diffraction element as claimed in Claim 1, wherein the diffraction grating is formed by isotropic material having no polarization anisotropy.

Claims 13 and 14 **(Canceled)**

15. **(Currently Amended)** A method comprising designing a diffraction grating formed on only one face of a light-transmittable member in a diffraction element such that a first laser beam

having a first wavelength λ_1 and a second laser beam having a second wavelength λ_2 are transmitted through the diffraction grating at first and second diffraction efficiencies, respectively;

wherein the diffraction grating has a plurality of land portions each having a width W_a and a plurality of groove portions each having a width W_b and a depth h alternately arranged therein and has a duty ratio defined as $\{W_a/(W_a+W_b)\}$ such that the first and second diffraction efficiencies are adjusted by using the duty ratio and the depth h of the diffraction grating as parameters;

~~The method as claimed in Claim 13,~~ wherein the depth h of the diffraction grating is approximately expressed by the following equation (7):

$$h=[N\lambda_1\lambda_2/\{\lambda_1(n_2-1)+\lambda_2(n_1-1)\}] \text{ ---}(7)$$

in which "N" is a natural number, "n1" is a refractive index of the diffraction element for the first laser beam and "n2" is a refractive index of the diffraction element for the second laser beam; and

wherein a zero-order diffraction efficiency of the first laser beam and ~~that a zero-order diffraction efficiency~~ of the second laser beam are ~~approximate~~ approximately equal to each other and a first-order diffraction efficiency of the first laser beam and ~~that a first-order diffraction efficiency~~ of the second laser beam are ~~approximate~~ approximately equal to each other.

16. **(Currently Amended)** The method as claimed in Claim 15, wherein the diffraction grating has a depth h_1 of the diffraction grating is expressed by the following equation (8):

$$h_1=[\lambda_1\lambda_2/\{\lambda_1(n_2-1)+\lambda_2(n_1-1)\}] \text{ ---}(8)$$

in which the natural number N is set to 1 in the equation (7).

17. **(Original)** The method as claimed in Claim 16, wherein when the duty ratio is 0.135, a ratio of the zero-order diffraction efficiency to the first-order diffraction efficiency is approximate to (10/1).

18. **(Currently Amended)** The method as claimed in Claim 15, wherein the diffraction grating has a depth h_2 of the diffraction grating is expressed by the following equation (9):

$$h_2=[2\lambda_1\lambda_2/\{\lambda_1(n_2-1)+\lambda_2(n_1-1)\}] \text{ ---}(9)$$

in which the natural number N is set to 2 in the equation (7).

19. **(Original)** The method as claimed in Claim 18, wherein when the duty ratio is 0.2, a ratio of the zero-order diffraction efficiency to the first-order diffraction efficiency is approximate to (10/1).

20. **(Currently Amended)** The method as claimed in Claim 15, wherein the diffraction grating has a depth h_3 of the diffraction grating is expressed by the following equation (10):

$$h_3 = [3\lambda_1\lambda_2 / \{\lambda_1(n_2-1) + \lambda_2(n_1-1)\}] \text{ ---(10)}$$

in which the natural number N is set to 3 in the equation (7).

21. **(Original)** The method as claimed in Claim 20, wherein when the duty ratio is 0.5, a ratio of the zero-order diffraction efficiency to the first-order diffraction efficiency is approximate to (10/1).

22. **(Currently Amended)** An optical head device comprising:

a first laser beam source for emitting a blue laser beam having a first wavelength λ_1 ;

a second laser beam source for emitting a red laser beam having a second wavelength λ_2 ;

an optical lens for condensing at a minute spot on an information recording face of an optical information medium the blue laser beam or the red laser beam at a minute spot on an information recording face of an optical information medium;

a photodetector for outputting, in response to the blue laser beam or the red laser beam reflected on the information recording face of the optical information medium, an electric signal corresponding to a quantity of the blue laser beam or the red laser beam; and

a diffraction element including a light-transmittable member and a diffraction grating formed on at least one face of the light-transmittable member;

wherein when the blue laser beam and the red laser beam are transmitted through the diffraction element, the diffraction element turns the blue laser beam and the red laser beam ~~are turned~~ into first and second diffracted beams having first and second diffraction efficiencies, respectively;

wherein the diffraction element functions to equalize the first and second diffraction efficiencies ~~to each other~~ by only the one face of the diffraction element;

wherein the diffraction grating has a first phase modulation amount ϕ_1 for the blue laser beam and a second phase modulation amount ϕ_2 for the red laser beam and the first and second phase modulation amounts ϕ_1 and ϕ_2 are, respectively, approximately expressed by the following equations (11) and (12):

$$\phi_1 = 2\pi N_1 \pm \Delta\phi \quad \text{---(11)}$$

$$\phi_2 = 2\pi N_2 \pm \Delta\phi \quad \text{---(12)}$$

in which "N1" and "N2" are natural numbers and " $\Delta\phi$ " is a phase variation amount;

and

wherein ~~the photodetector the diffraction element generates a diffracted beam from the blue laser beam or the red laser beam and the photodetector receives the first or second diffracted~~ refracted beam so as to detect a servo signal.

Claim 23 (Canceled)

24. (Currently Amended) An optical information apparatus comprising:

an optical head device which includes a first laser beam source for emitting a blue laser beam having a first wavelength λ_1 , a second laser beam source for emitting a red laser beam having a second wavelength λ_2 , an optical lens for condensing ~~at a minute spot on an information recording face of an optical information medium~~ the blue laser beam or the red laser beam at a minute spot on an information recording face of an optical information medium, a photodetector for outputting, in response to the blue laser beam or the red laser beam reflected on the information recording face of the optical information medium, an electric signal corresponding to a quantity of the blue laser beam or the red laser ~~beam~~ beam, and a diffraction element having a light-transmittable member and a diffraction grating formed on at least one face of the light-transmittable member;

wherein when the blue laser beam and the red laser beam are transmitted through the diffraction element, the diffraction element turns the blue laser beam and the red laser beam ~~are turned~~ into first and second diffracted beams having first and second diffraction efficiencies, respectively;

wherein the diffraction element functions to equalize the first and second diffraction efficiencies ~~to each other~~ by only the one face of the diffraction element;

wherein the diffraction grating has a first phase modulation amount ϕ_1 for the blue laser beam and a second phase modulation amount ϕ_2 for the red laser beam and the first and second phase modulation amounts ϕ_1 and ϕ_2 are, respectively, approximately expressed by the following equations (11) and (12):

$$\phi_1 = 2\pi N_1 \pm \Delta\phi \text{ ---(11)}$$

$$\phi_2 = 2\pi N_2 \pm \Delta\phi \text{ ---(12)}$$

in which "N1" and "N2" are natural numbers and " $\Delta\phi$ " is a phase variation amount;

~~wherein the diffraction element generates a diffracted beam from the blue laser beam or the red laser beam and the photodetector receives the refracted~~ first or second diffracted beam so as to detect a servo signal;

a motor for rotating the optical information medium; and

an electric circuit for controlling and driving, on the basis of a signal received from the optical head device, the motor or one of the optical lens, the first laser beam source and the second laser beam source of the optical head device.

Claim 25 (Canceled)

26. (Original) A computer comprising:

an optical information apparatus of Claim 24;

an input unit for inputting information;

an arithmetic unit for performing arithmetic operation on the basis of the information inputted by the input unit or information reproduced from the optical information apparatus; and

an output unit for displaying or outputting the information inputted by the input unit, the information reproduced from the optical information apparatus or a result of the arithmetic operation of the arithmetic unit.

Claim 27 (Canceled)

28. (Currently Amended) An optical information medium player comprising:

an optical information apparatus of Claim 24; and

a decoder for converting ~~into an image~~ an information signal obtained from the optical information apparatus into an image.

Claim 29 **(Canceled)**

30. **(Currently Amended)** A car navigation system comprising:
an optical information apparatus of Claim 24; and
a decoder for converting ~~into an image~~ an information signal obtained from the optical information apparatus into an image.

Claim 31 **(Canceled)**

32. **(Original)**

Claim 33 **(Canceled)**

34. **(Original)** An optical disc server comprising:
an optical information apparatus of Claim 24; and
an input/output terminal for exchanging information with an external appliance.

Claim 35 **(Canceled)**